

Appendices to Accompany “Modeling Social Resilience in Communities”

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I. APPENDIX A: BKB FRAGMENTS

This appendix provides the Bayesian Knowledge Base (BKB) [1] fragments used in our modeling and simulation. The simulation consists of a baseline step followed by eleven events (time steps). These events were found to have major influence the social resilience of the Somali fishing communities. During the initial step T_0 , baseline BKB fragments, representing the factors important for the communities when deciding to pursue piracy (Fig. 1) or fishing (Fig. 2) as their livelihood. During the remaining eleven events T_1 to T_{11} , event BKBs that represent their effects on the behaviors of the communities were used in the model. During each time step, the BKBs are fused using BKB fusion algorithms [2], [3]. The BKB belief updating algorithm [1] is used to calculate the posterior probability of the random variable ‘(G) *Livelihood is*’, which is used to measure the resilience of the fishing communities.

TABLE I
TIMELINE OF EVENTS USED TO MODEL RESILIENCE

Time Step	Time Period	Description	BKB(s)
T_0	1991	With the fall of the Barre regime in 1991, Somalia developed into a civil strife among its clans that continues even till today. The absence of a central government led to collapse of infrastructure (storage facilities, credit markets, etc.) of the fishermen [4].	Fig. 1 and Fig. 2
T_1	1991-2004	The absence of coast guards encouraged foreign fishing companies to conduct illegal fishing in Somali waters leading to reduction of fish stocks [5].	Fig. 3
T_2	1993-2004	Taking advantage of lawlessness, foreign companies dumped hazardous waste in Somali waters further decimating fish stocks. Fishermen start to take matters into their own hands which led to piracy [5].	Fig. 4
T_3	Dec. 2004	The Tsunami that caused havoc in South East Asia, affected the coastal regions of Somalia badly. The boats of the fisherman were swept away depriving them of their only livelihood [6]. Hence it led to reduced fishing and a surge in piracy [7].	Fig. 5
T_4	Jun. 2006	During the brief reign of the Islamic Courts Union (ICU), they enforced strict rules to control piracy. The fear of the tough Sharia punishments virtually wiped out piracy for remaining part of the year [4].	Fig. 6
T_5	Dec. 2006	The sudden fall of ICU created a lot of chaos and instability throughout Somalia. This gave plenty of opportunity for piracy to flourish in Puntland and southern Somalia [4].	Fig. 7
T_6	Sep. 2008	By 2008, the Somalia coast had become the world’s most piracy prone area. The hijack of a cargo ship MV Faina by Somali pirates was one of the highest profile vessels captured by pirates. It was later released in Feb 2009 upon receiving a ransom of \$3.2 million [4].	Fig. 8
T_7	Nov. 2008	While MV Faina was still being held at ransom, another group of Somali pirates hijacked MV Sirius Star, which was carrying tons of crude oil. The pirate attacks had reached its peak now and more people had moved into this occupation and they are seen as an international threat [4], [8].	Fig. 9
T_8	Jun. 2009	UN and the international community approved countries to deploy their war ships to protect against Somali pirates on Oct 2008. But the news of first known interception by an international warship was on June 2009 [7].	Fig. 10
T_9	Mar. 2010	Commercial vessels started arming ships with private security guards, and implemented tactics and strategies to delay or avoid attacks from pirates[7], [9].	Fig. 11
T_{10}	Jan. 2012	Piracy and lack of a proper central government led to high inflation rates along the coastal regions by 2008. This kept on increasing in the following years and led to frustration and anger within the community [10].	Fig. 12
T_{11}	Mar. 2012	Anti-piracy forces, such as the Puntland Marine Police, were deployed on the shore. This reduced the piracy by a large extent [11].	Fig. 13

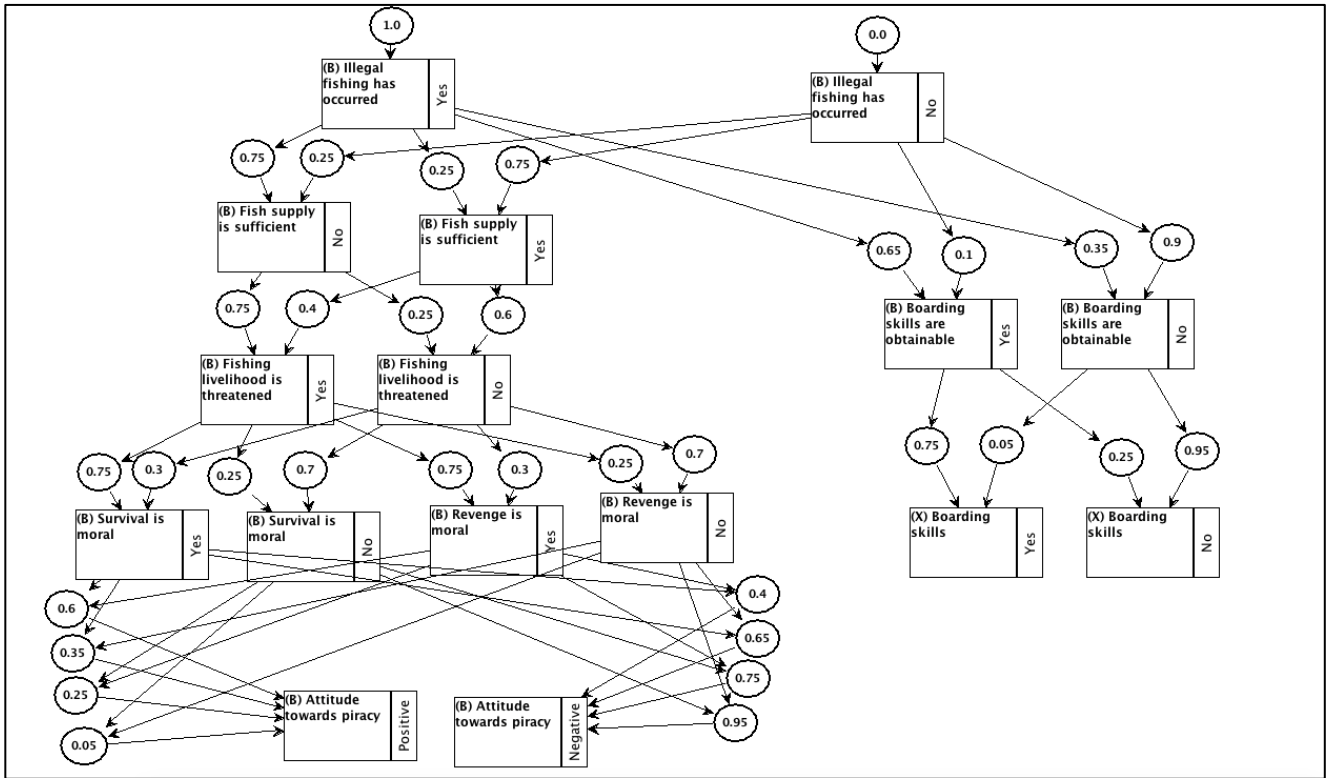


Fig. 3. Event (T_1) BKB showing the effects of illegal fishing on piracy and the fishing community

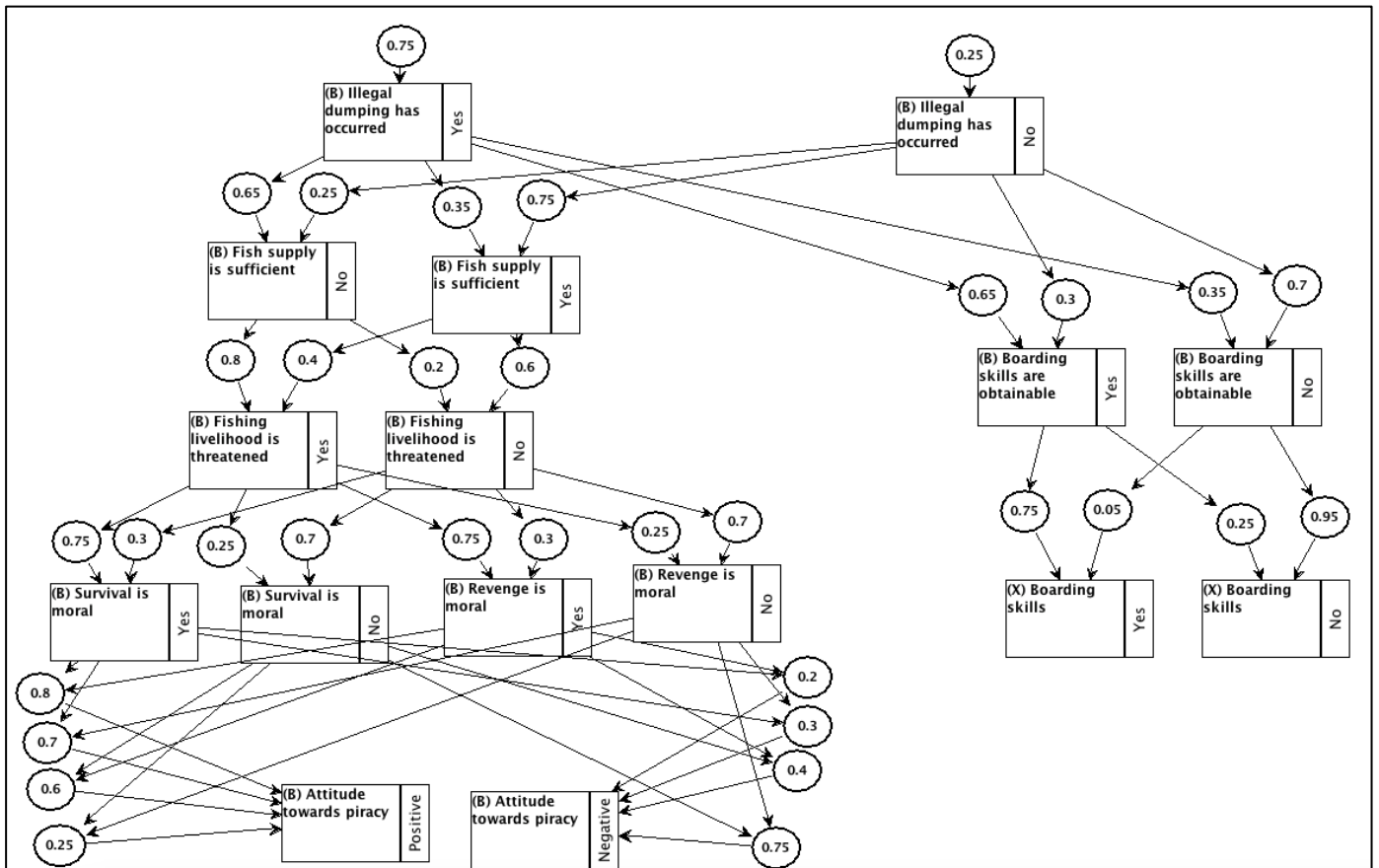


Fig. 4. Event (T_2) BKB showing the effects of hazardous toxic waste dumping near the Somali waters on piracy and the fishing community

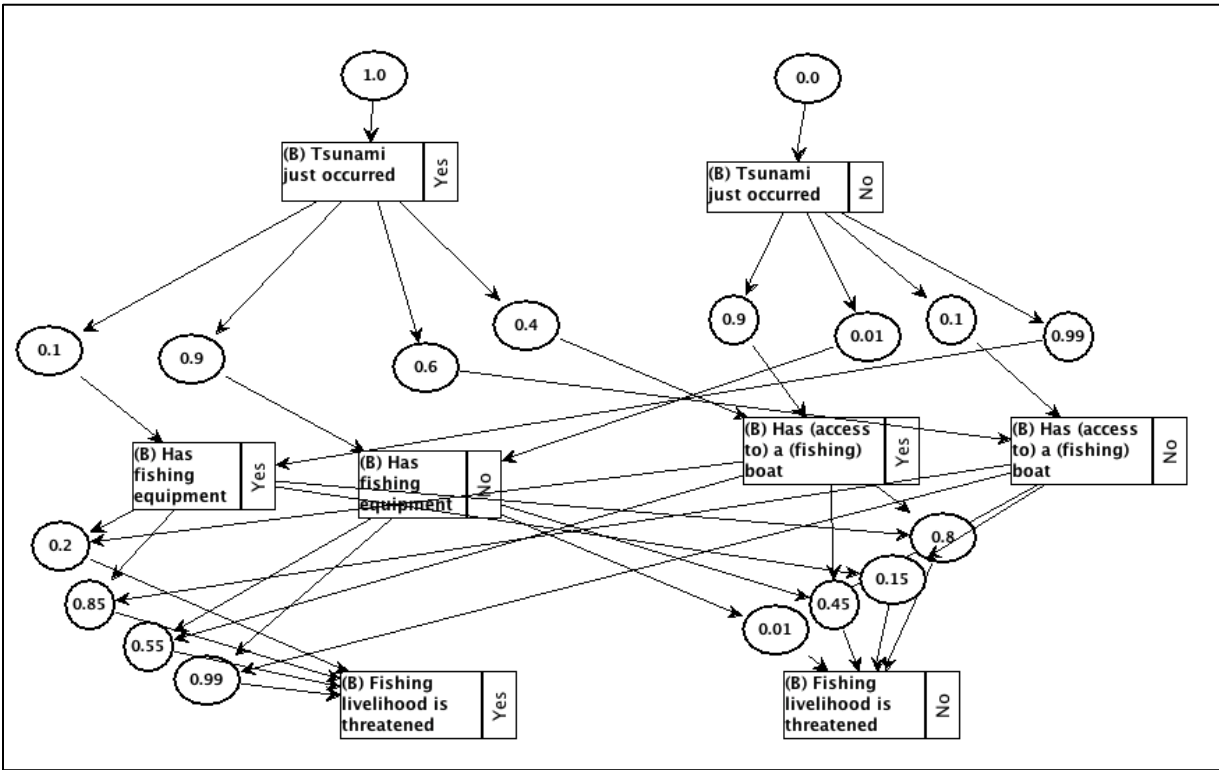


Fig. 5. Event (T₃) BKB showing the effects of December 2004 on the fishing community

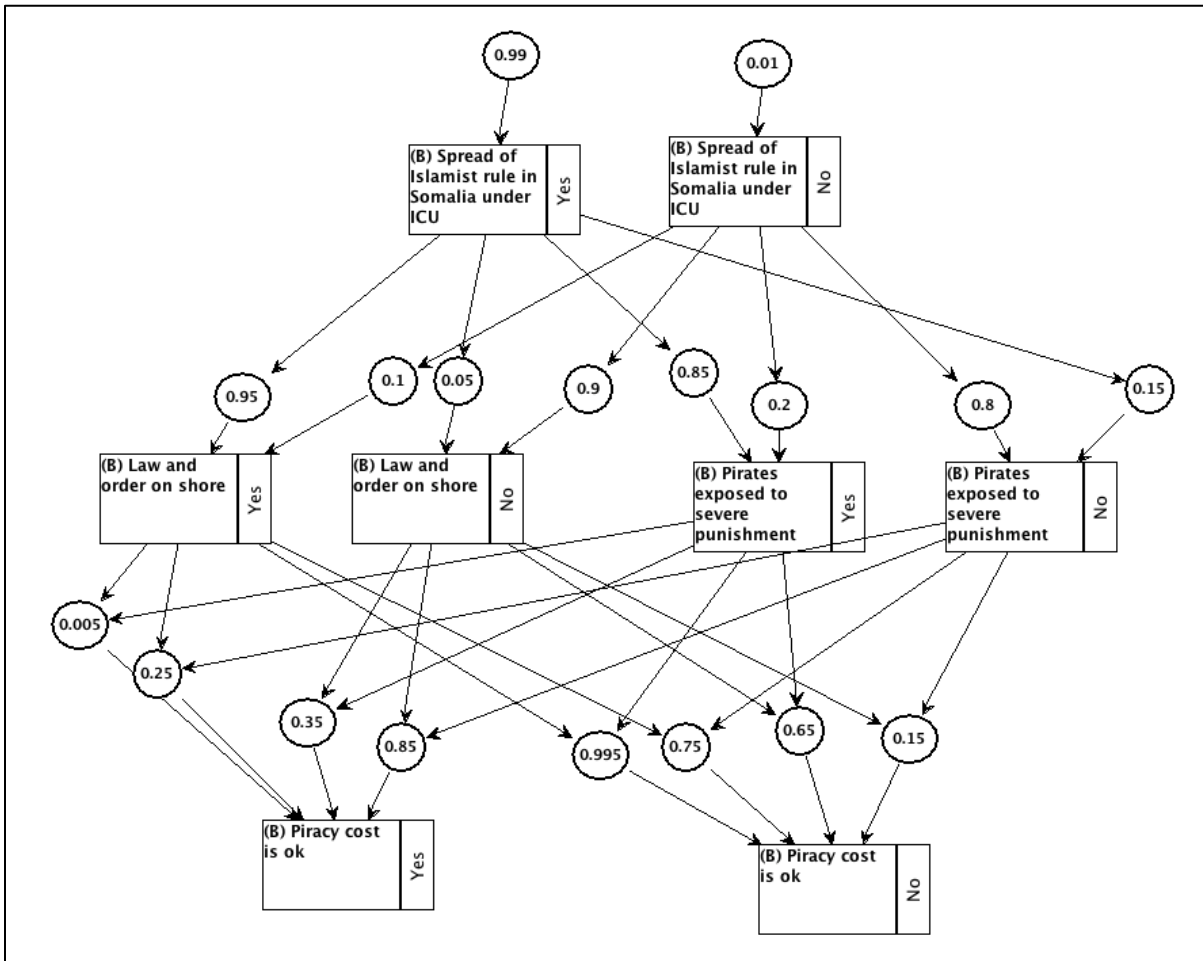


Fig. 6. Event (T₄) BKB showing the rule of ICU increasing the law and order thereby increasing the cost of doing piracy

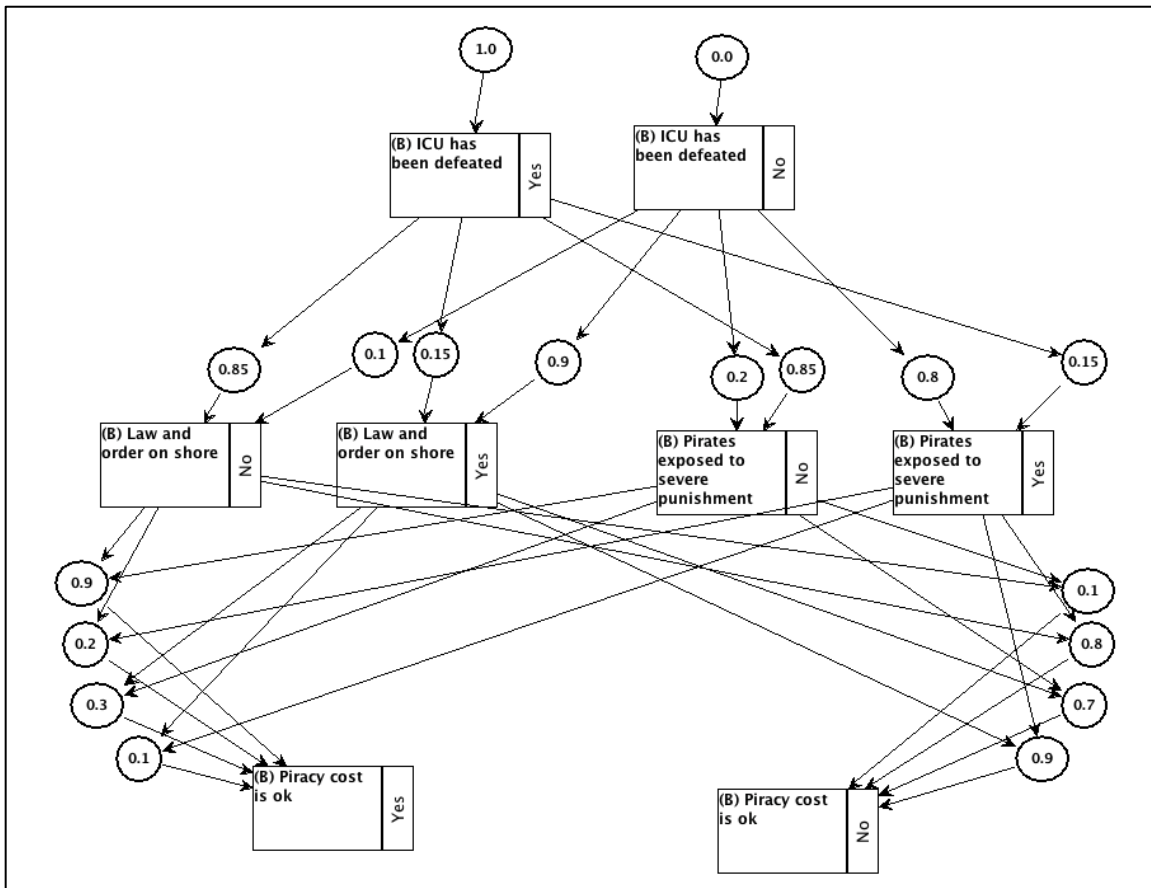


Fig. 7. Event (T₅) BKB showing the downfall of ICU which again reduces the law and order and thereby reducing the cost of piracy again

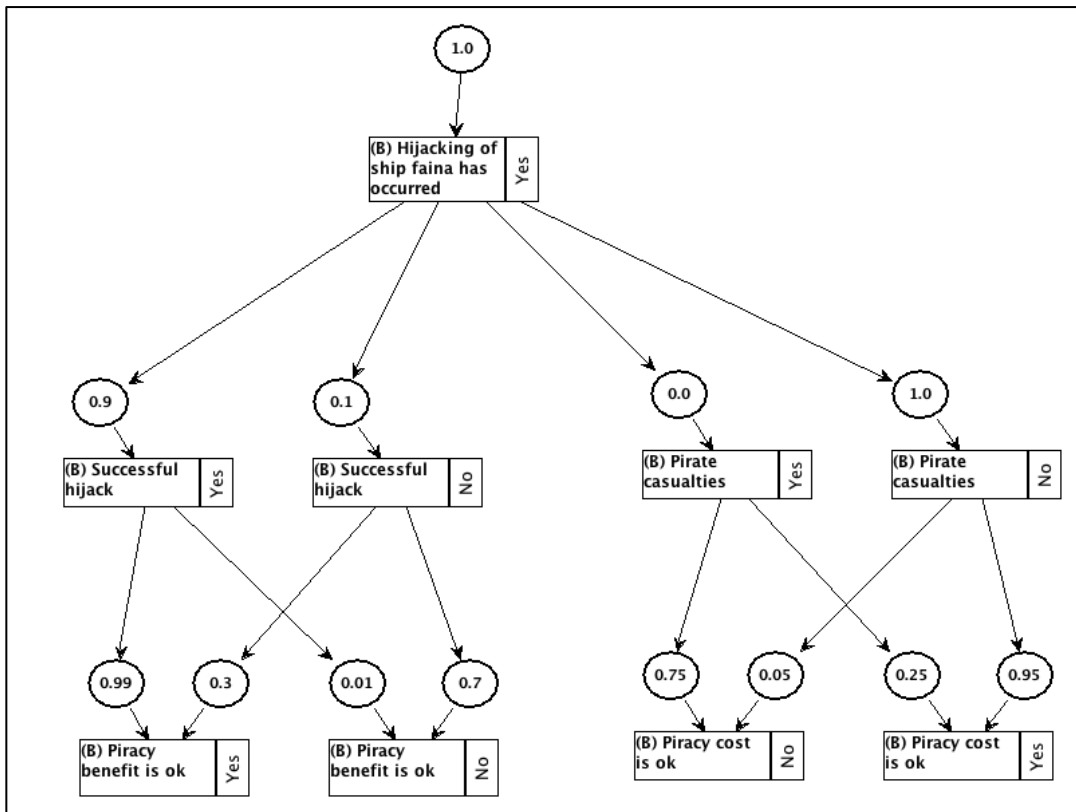


Fig. 8. Event (T₆) BKB showing the effects of hijacking of ship MV Faina on the piracy's cost and benefit

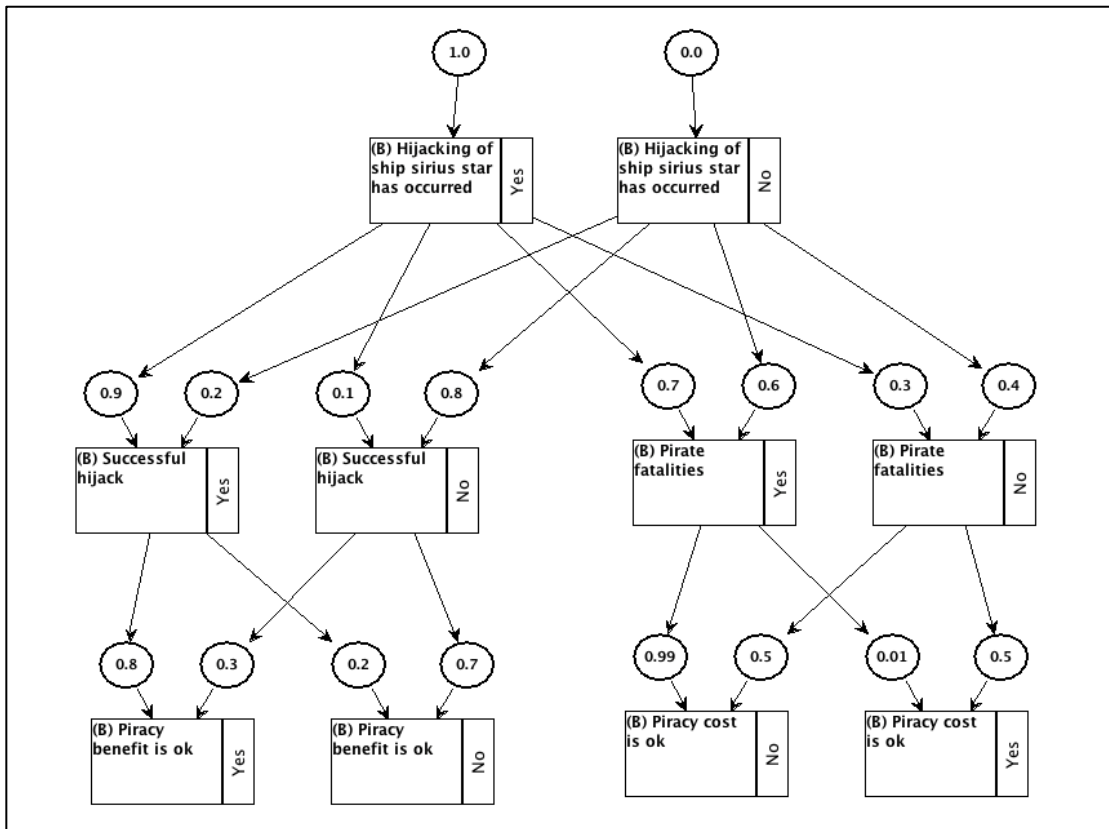


Fig. 9. Event (T₇) BKB showing the effects of hijacking of ship MV Sirius Star on the piracy's cost and benefit

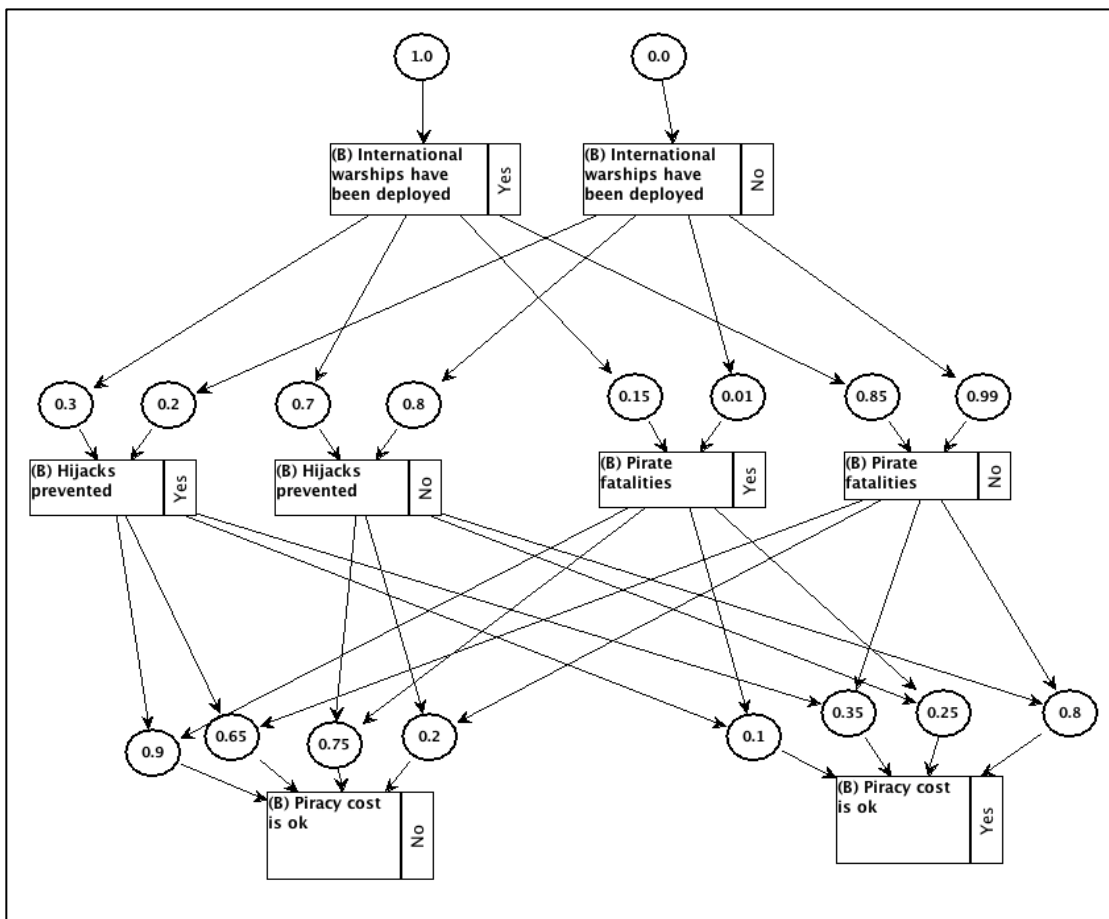


Fig. 10. Event (T₈) BKB showing the effects of International warships that are being deployed against the pirates

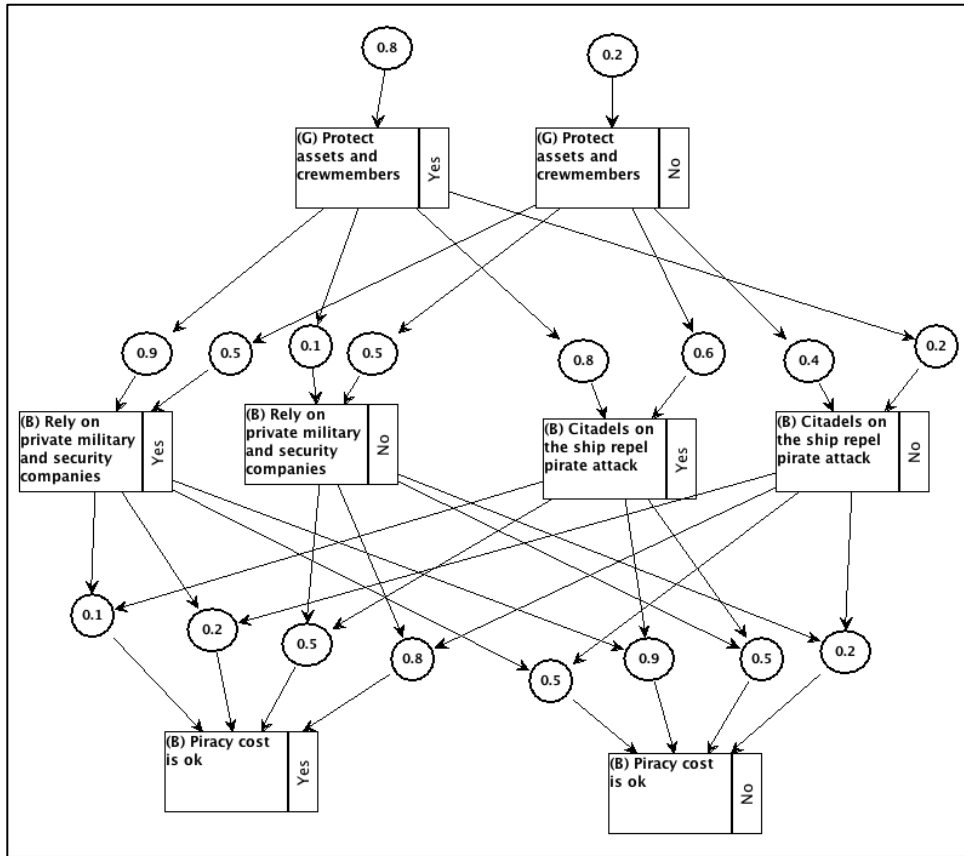


Fig. 11. Event (T_9) BKB showing the effects of commercial ships employing private securities and militaries to avoid attacks from the pirates

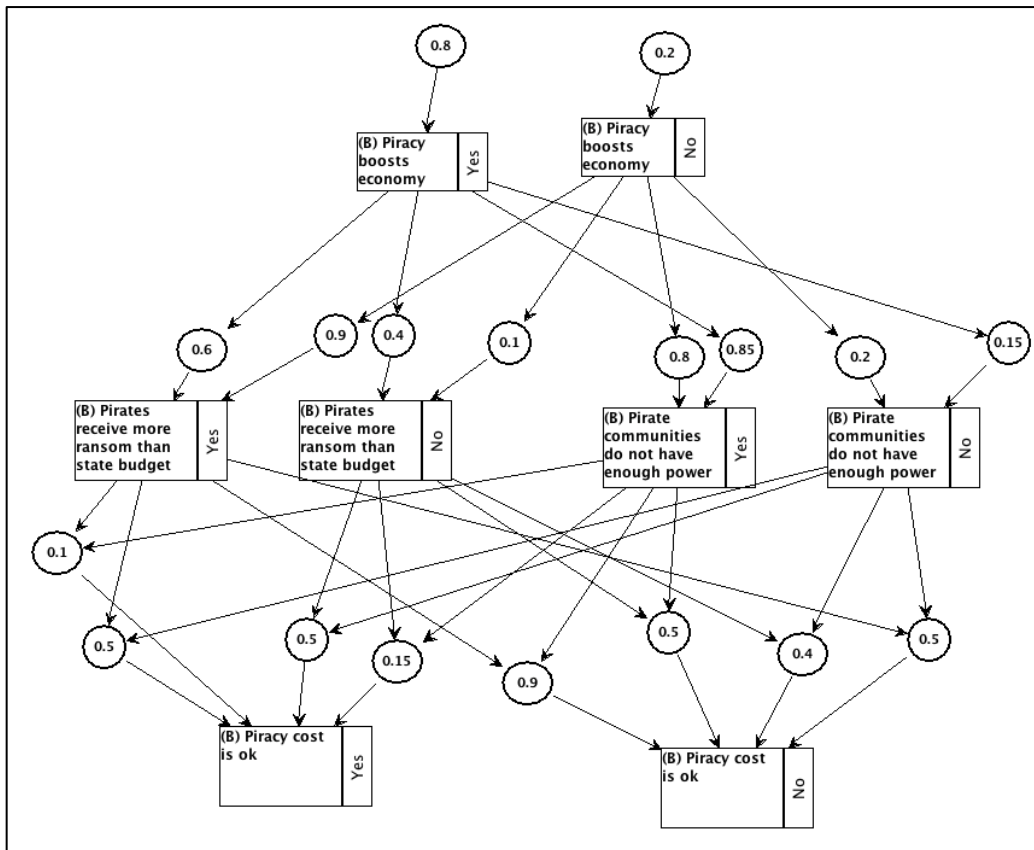


Fig. 12. Event (T_{10}) BKB showing the effects of piracy on the coastal economy and how it affects the pirate's influence in the coastal communities

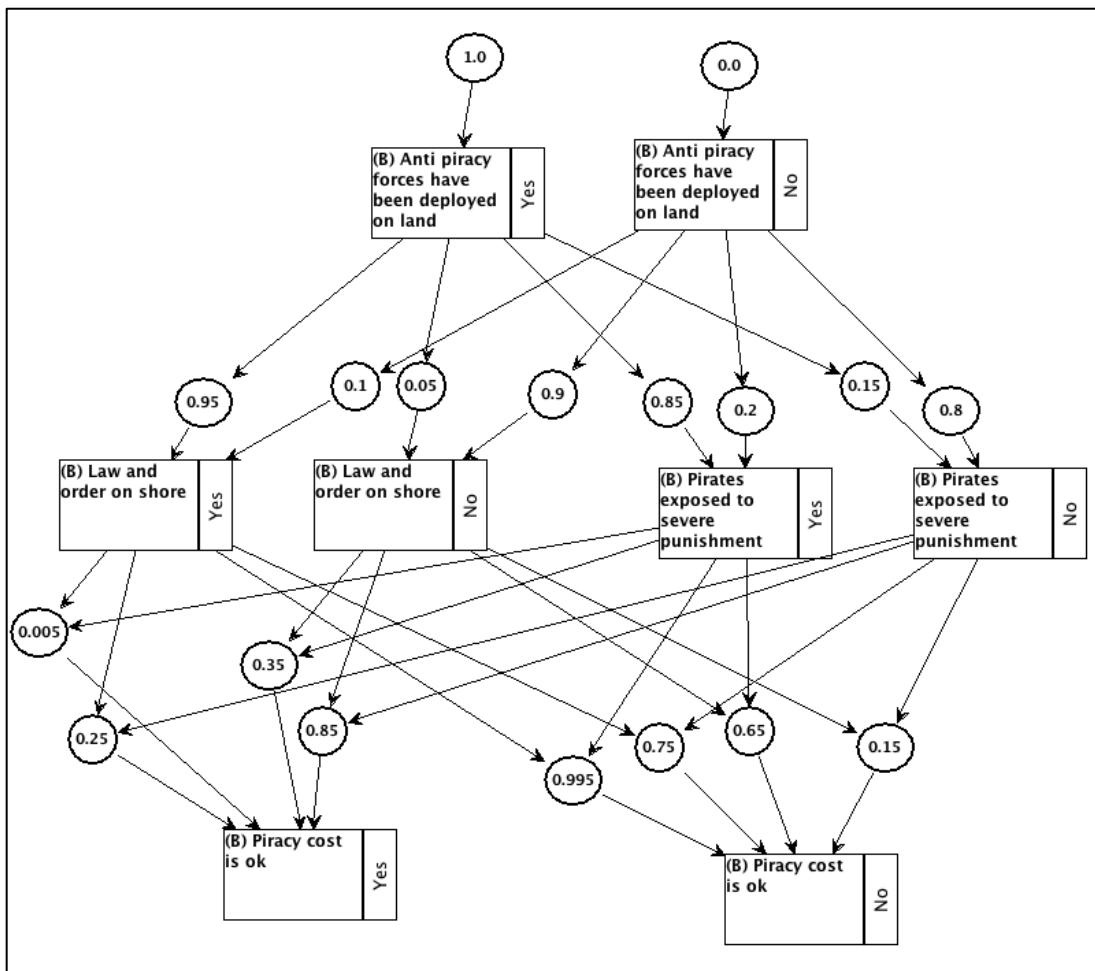


Fig. 13. Event (T₁₁) BKB showing the effects of land-based anti-piracy forces that are deployed to ensure law and order on the shore

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